Remarks:

Claims 1-32 are currently pending in the application. Of these, claims 2 and 5 have been cancelled with this response, and claims 1, 24 and 25 have been amended with this response. New claims 33-37 have been added with this response. Support for the new claims may be found, for example, in the claims as originally filed, as well as in paragraphs 0010, 0011 and 0012 of the specification.

Reconsideration of the Examiner's objection to the disclosure is respectfully requested.

The specification has been amended to remove the reference to a website at the bottom of Page 12. It is therefore respectfully submitted that the Examiner's objection has been overcome.

Reconsideration of the Examiner's rejection of claims 1 and 12 under 35 U.S.C. § 102 as being anticipated by U.S. 6,019,284 (Freeman et al.) is respectfully requested.

Claim 1 (from which claim 12 depends) has been amended with this response to include the limitations of dependent claims 2 and 5. The Examiner has correctly recognized that the subject matter of each of these dependent claims is not anticipated by Freeman et al. Accordingly, as amended, claim 1 is not anticipated by Freeman et al.

Reconsideration of the Examiner's rejection of claims 5-11, 13-17, 21 and 22 under 35 U.S.C. § 103(a) as being unpatentable over U.S. 6,019,284 (Freeman et al.), and his rejection of claims 2-4, 18-20 and 23 under 35 U.S.C. § 103(a) as being unpatentable over U.S. 6,019,284 (Freeman et al.) in view of U.S. 5,314,765 (Bates), is respectfully requested.

As noted above, claim 1 (from which claims 5-11 depend) has been amended with this response to include the limitations of dependent claims 2 and 5. Hence, as amended, claim 1 specifies that the battery of the chip card has a solid-state electrolyte, and is hermetically sealed within the card. For reasons explained in greater detail below, it is respectfully submitted that these amendments patentably distinguish the claimed invention from Freeman et al., taken either alone or in combination with Bates.

The Examiner asserts, on Page 3 of the Office Action, that "Encapsulating ... batteries within circuit cards with epoxy resins is old and well known in the art." However, the Examiner has provided no evidence in support of this contention. Moreover, even if the Examiner is correct in asserting that encapsulated batteries are well known to the art, the Examiner has not shown that such encapsulated batteries are *hermetically* sealed within the card as required by claim 1. To the contrary, as noted at Page 4, Line 17 of the present application, conventional battery systems used in chip cards require openings for the release of gases that are formed during their use. These openings provide an access point that can be exploited by someone intent on tampering with the card. The present Applicants have overcome this problem by employing, in a chip card, a thin film battery having a solid electrolyte. Such batteries do not emit gases during their use, and may thus be hermetically sealed within the chip card, thereby denying a potential access point to someone intent on tampering with the card. Such an advantage is neither taught nor suggested in the art cited by the Examiner.

Indeed, contrary to rendering the claimed invention obvious, the art cited by the Examiner suggests the unobviousness of the present invention. If it is assumed that the Examiner is correct in asserting that Bates teaches a thin film battery having a solid electrolyte, and in particular, a lithium anode having a layer of lithium phosphorous oxynitride thereon, then this means that such batteries were known by 1993, the year that Bates was filed (Bates issued as a patent in 1994). As noted in the background section of the present application, however, chip cards have been in existence since the mid-1970s, and the need (and therefore incentive) to make such cards tamper resistant has been known to the art for almost as long. Despite this longstanding need for tamper resistant chip cards, however, and despite the fact that thin film batteries having a solid electrolyte have presumably been known for over a decade, chip cards have made extensive use of conventional batteries requiring venting. Indeed, the Examiner has not presented any art that shows the use of thin film batteries having a solid electrolyte in a chip card, nor has the Examiner presented any art which describes such batteries being hermetically sealed in an encapsulant. Given the longstanding need to make chip cards more tamper resistant, if the use in chip cards of batteries of the type described in Bates were obvious, and if the advantages these batteries offer in improving the tamper resistance of chip cards were appreciated by those skilled in the art, then there would be documentary

evidence of the use of these batteries in chip cards by now. The fact that the Examiner has not been able to find such evidence strongly suggests that the use of these batteries in chip cards was not obvious, and that the advantages offered by these batteries in making chip cards more tamper resistant were not appreciated by those skilled in the art.

#4 The Examiner is also respectfully reminded that he may not use hindsight in assessing the obviousness of a claimed invention. Here, the Examiner has assumed that one skilled in the art would have found it obvious to use a thin film battery having a solid electrolyte, and to hermetically seal the battery within the card. However, there is nothing in the cited art that suggests that batteries should be hermetically sealed within a chip card. To the contrary, as noted above, conventional batteries require venting and thus cannot be hermetically sealed within a chip card. Since the only mention of hermetically sealing a battery within a chip card is found within the four corners of the present application, it is respectfully submitted that the Examiner has engaged in the impermissible use of hindsight in assessing the patentability of the present invention.

With respect to claim 13, from which claims 14-17, 21 and 22 depend, Applicants note that this claim is essentially drawn to a chip card having a volatile memory device which is connected to a battery by way of two leads having opposite polarity. The memory device and the battery leads in the vicinity of the memory device are all encapsulated in an epoxy resin. Such a set-up is very advantageous in creating a tamper-resistant card, because the application of many common tampering schemes would result in purging of the memory device before its contents could be accessed.

In particular, epoxy resins are resistant to most solvents and acids. Therefore, most tampering schemes require the use of fuming nitric acid, or similar conductive materials, for the removal of the epoxy resin. See, e.g., paragraph 0008 of the present application. However, by encapsulating both the memory device and the adjacent battery leads in the epoxy resin, the present invention frustrates this type of approach, because the use of a conductive material such as nitric acid to remove the memory device from the encapsulating epoxy resin would also expose the battery leads, thus shorting the power supply. This in turn would result in a purge of the volatile memory device, thus destroying any confidential information recorded therein before it could be accessed.

The Examiner has argued, in essence, that the various features set forth in claim 13 are separately known to the art. These include, for example, the use of volatile memory devices and the use of an epoxy resin as an encapsulant. However, the Examiner has not pointed to any teaching or suggestion in the cited art that these various features should be combined in the particular manner set forth in claim 13 to achieve a tamper-resistant chip card. In this regard, the Examiner is respectfully reminded that the mere fact that the elements of a claimed invention were separately known to the art does not negate the patentability of the claimed invention. Indeed, most inventions are made from components or elements that were previously known. Hence, the Examiner must show that there is some teaching or suggestion to combine the various elements as required to arrive at the claimed invention. The Examiner has not provided such incentive here, nor does such incentive appear to exist.

Reconsideration of the Examiner's rejection of claims 24-32 under 35 U.S.C. § 103(a) as being unpatentable over U.S. 5,977,745 (Ryan) is respectfully requested.

Claim 24 has been amended with this response to more clearly specify that the claimed apparatus is a chip card. Applicants note that claim 24 and the claims dependent thereon are directed toward devices in which the microprocessor uses a pseudorandom sequence of pulses to trickle charge the battery. Claim 28 and the claims dependent thereon contain similar limitations. This pseudorandom sequence creates emissions that tend to mask the emissions output by other parts of the microprocessor, which emissions could be used to fraudulently gain access to the chip card in a reverse engineering process.

The Examiner relies on Ryan for teaching a battery charging apparatus which includes a microprocessor connected to a battery. The Examiner concedes that Ryan does not teach trickle recharge or the pseudo random charge elements as required, for example, by claims 24 and 27, respectively, but argues that both elements are known to the art. However, the Examiner has not produced any documentary evidence which shows this to be the case. Here, the Examiner's attention is respectfully drawn to M.P.E.P. 2144.03, which directs that

> If justified, the examiner should not be obliged to spend time to produce documentary proof. If the knowledge is of such notorious character that official

> notice can be taken, it is sufficient so to state. *In re Malcolm*, 129 F.2d 529, 54 USPQ 235 (CCPA 1942). *If the applicant traverses such an assertion the examiner should cite a reference in support of his or her position.* [emphasis added]

In the present case, Applicants traverse the assertion that the use of trickle recharge or pseudo random charge elements are well known to the art of chip cards. Accordingly, if the Examiner wishes to maintain the present rejection, it is respectfully requested that he produce documentary evidence which shows these elements to be well known to the art of chip cards.

Moreover, Applicants respectfully note that Ryan was concerned with battery cells for relatively large wireless devices such as cell phones and personal computers. See, e.g., Col. 1, Lines 13-15 and Col. 5, Lines 1-7. No mention of chip cards is made in Ryan. Indeed, it is clear from Ryan that the battery types contemplated therein were large, bulky batteries of a type completely unsuitable for chip cards. See, e.g., Col. 4, Lines 54-61, which describes size AA and C batteries. See also Col. 3, Line 25, which describes these batteries as being "loose off-the-shelf battery cells". The devices described in Ryan, and the batteries typically used to operate them, are sufficiently different from chip cards that one skilled in the art of chip cards would not look to such art in designing battery systems for a chip card.

Applicants also note that chip cards present unique security concerns during recharging that are not typically encountered in other devices, such as devices of the type that Ryan was concerned with. Because of their small size and the fact that they are designed to be carried around, chip cards are much more prone to being closely analyzed for purposes of fraud, typically by closely monitoring the emissions of the microprocessor in these cards. The use of a pseudorandom sequence during battery charging creates emissions that tend to mask the emissions output by other parts of the microprocessor that could be used to fraudulently gain access to the chip card in a reverse engineering process. Neither Ryan nor the other art cited by the Examiner teaches or recognizes this problem (indeed, devices of the type described in Ryan are not typically subjected to this type of attack), nor does the cited art teach Applicant's solution to it.

The Examiner also notes that the batteries in Ryan "may be lithium". However, lithium is a common metal used in a wide variety of batteries, including commercially

available size AA batteries, and its mention in Ryan should not be construed to suggest thin film batteries having solid electrolytes of the type disclosed in the present application. Indeed, the only other mention of lithium batteries in Ryan is at Col. 4, Line 58, where Ryan mentions the use of "size AA liquid lithium battery cells". These batteries are clearly not thin film battery cells of the type described in the present application.

Applicants submit that the application is in condition for allowance. An early indication thereof is respectfully requested. Please charge any fee deficiency due with this response, or credit any overpayment, to Deposit Account No. 50-1047.

Respectfully submitted,

2-13-03

Date

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EXHIBIT A:

(version of claims with markings to show changes made)

1.(Amended) A chip card, comprising a thin film battery;

wherein said battery has a solid-state electrolyte, and wherein said battery is hermetically sealed within the card.

24.(Amended) A chip card, comprising [credit card sized apparatus including]:

a battery;

an external power source input for coupling to an external power source; and

a microprocessor being coupled to the external power source input and to the battery, said microprocessor trickle charging the battery when an external power source is coupled to the external power source input.

25.(Amended) The apparatus according to claim 24 [25], wherein the microprocessor includes at least one digital output port, which is coupled to the battery.

EXHIBIT B:

(clean version of claims including amendments)

A1.

1.(Amended) A chip card, comprising a thin film battery; wherein said battery has a solid-state electrolyte, and wherein said battery is hermetically sealed within the card.

3. The chip card according to claim 2, wherein said electrolyte comprises lithium phosphorous oxynitride.

4. The chip card according to claim 1, wherein the battery comprises a lithium anode having a layer of lithium phosphorous oxynitride thereon.

6. The chip card according to claim 1, further comprising a volatile memory unit.

7. The chip card according to claim 6, wherein said volatile memory unit is selected from the group consisting of RAM, DRAM and SRAM.

8. The chip card according to claim 6, wherein said volatile memory unit is an SRAM memory unit.

9. The chip card according to claim 6, wherein said memory unit is encapsulated in an epoxy resin.

10. The chip card according to claim 9, further comprising a first conductive element and a second conductive element, and wherein said battery further comprises an anode and a cathode which are in electrical contact with said volatile memory unit by means of said first and second conductive elements, respectively, and wherein at least a portion of said first and second conductive elements are also encapsulated in an epoxy resin.

11. The chip card according to claim 10, wherein said first and second conductive elements are encapsulated in an epoxy resin in the vicinity of said memory unit.

12. The chip card according to claim 1, wherein said chip card further comprises a microprocessing unit.

13. A chip card, comprising:

a substrate;

a volatile memory device disposed on said substrate; and

a battery in electrical contact with said memory device by way of first and second conductive elements, said first and second conductive elements being of opposite polarity;

wherein said memory device is encapsulated in an epoxy resin, and wherein said first and second conductive elements are also encapsulated in an epoxy resin in the vicinity of said memory device.

14. The chip card according to claim 13, wherein said memory device is of a type selected from the group consisting of RAM, DRAM and SRAM.

15. The chip card according to claim 13, wherein said volatile memory unit is an SRAM memory unit.

16. The chip card according to claim 13, wherein said chip card further comprises a microprocessing unit.

17. The chip card according to claim 13, wherein said battery is a thin film battery.

18. The chip card according to claim 17, wherein said battery includes a solid-state electrolyte.

19. The chip card according to claim 18, wherein said electrolyte comprises lithium phosphorous oxynitride.

20. The chip card according to claim 17, wherein the battery comprises a lithium anode having a layer of lithium phosphorous oxynitride thereon.

21. The chip card according to claim 17, wherein said battery is hermetically sealed within the card.

22. The chip card according to claim 17, wherein said memory device is disposed within a chip module, and wherein said battery is disposed on a surface of said chip module.

23. The chip card according to claim 17, wherein said memory device is disposed within a chip module, and wherein said battery is also disposed within said chip module.

24.(Amended) A chip card, comprising:

a battery;

an external power source input for coupling to an external power source; and

a microprocessor being coupled to the external power source input and to the battery, said microprocessor trickle charging the battery when an external power source is coupled to the external power source input.

a2

25.(Amended) The apparatus according to claim 24, wherein the microprocessor includes at least one digital output port, which is coupled to the battery.

26. The apparatus according to claim 25, wherein the microprocessor transmits a series of digital pulses to the battery when the external power source is coupled to the external power source input.

27. The apparatus according to claim 26, wherein the microprocessor transmits a pseudorandom sequence of digital pulses to the battery when the external power source is coupled to the external power source input.

28. A method for charging a battery comprising:

coupling the battery terminals to a microprocessor output port; and

transmitting a digital signal to the battery from the microprocessor port when the microprocessor is powered from a power source other than the battery.

29. The method according to claim 28, further comprising transmitting a pseudorandom sequence of digital pulses to the battery.

30. The method according to claim 28, wherein the battery comprises a thin film battery with a solid electrolyte.

31. The method according to claim 28, further comprising connecting the terminals of the battery directly to the microprocessor output port without intermediate devices.

32. The method according to claim 28, further comprising connecting the terminals of the battery directly to the microprocessor output port through a diode.

a3

33.(New) A chip card, comprising:

a thin film battery having a solid-state electrolyte, wherein said battery is hermetically sealed within the card;

a volatile memory unit;

an external power source input for coupling to an external power source; and

a microprocessor being coupled to the external power source input and to the battery, said microprocessor trickle charging the battery when an external power source is coupled to the external power source input.

34.(New) The chip card according to claim 33, wherein said electrolyte comprises lithium phosphorous oxynitride.

35.(New) The chip card of claim 33, wherein the battery comprises a lithium anode having a layer of lithium phosphorous oxynitride thereon.

36.(New) The chip card of claim 33, wherein the microprocessor is coupled to the external power source input and to the battery, and wherein the microprocessor is

adapted to trickle charge the battery when an external power source is coupled to the external power source input.

Concl'd a3

37.(New) The chip card of claim 33, wherein the battery is in electrical contact with said volatile memory unit by way of first and second conductive elements, said first and second conductive elements being of opposite polarity, wherein said volatile memory unit is encapsulated in an epoxy resin, and wherein said first and second conductive elements are also encapsulated in an epoxy resin in the vicinity of said volatile memory unit.

EXHIBIT D:

(Marked-up version of replacement paragraph showing amendments)

[0011] The use of thin film batteries in the present invention offers a number of advantages over the use of conventional batteries. In particular, thin film batteries have long cycle lives, with thousands of charge-discharge cycles per life. They also exhibit long shelf lives, often with little or no measurable change in their parameters even after years of storage. Thin film batteries operate over a wide temperature range; thus, thin film batteries have been shown to perform reliably in temperature cycle tests carried out between 25°C to 100°C, and both lithium-ion and lithium-free thin film batteries can be heated to 250°C prior to initial charging with no discernable change in performance. Thin film batteries are also rechargeable, and therefore do not have to be any larger than the size required to supply the requisite power and energy for a single duty cycle. Thin film batteries may also be charged at high current densities, resulting in short recharge times. While the recharge time depends strongly on the resistance of the battery and its capacity, thin film batteries having $LiCoO_2$ cathodes have been made which recharge to greater than 90% capacity in only 6 minutes. Other attributes of thin film batteries, as well as thin film battery designs and methods for making them, are described, for example, in U.S. 5,314,765 (Bates), U.S. 5,445,906 (Hobson et al.), U.S. 5,569,520 (Bates), and U.S. 5,705,293 (Hobson) [, and at http://www.ssd.ornl.gov/Programs/batteryWeb/index.htm].

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